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Accidental Launch Protection System: Requirements and Proposed Concepts

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Accidental Launch Protection System: Requirements and Proposed Concepts

SUMMARY

During the last year, many in Congress and the Administration have debated the feasibility and the desirability of limited ballistic missile defenses. Both the Senate and the House Armed Services Committees have held hearings to explore systems and technologies that might provide such a defense. Within the Administration, the SDI Milestone Panel of the Defense Science Board recommended that the United States deploy limited, ground-based defenses as the first step in SDI.

Senator Nunn launched the debate with his proposal for an Accidental Launch Protection System (ALPS), to protect against accidental or unauthorized launches of ballistic missiles. Accidental and unauthorized launches would create very different types of threats. An accidental launch would probably include one missile, and up to ten warheads. An unauthorized launch, on the other hand, might include up to 20 missiles and 200 warheads. An ALPS might not protect the United States from these launches if it complied with the terms of the ABM Treaty. The permitted 100 interceptors could be overwhelmed by an unauthorized launch, and it might be overwhelmed by an accidental launch if the missile carried devices that confuse radars and other sensors. Nonetheless, an ALPS might reduce damage to the United States from a Soviet launch and might protect the United States from some types of ballistic missile attacks launched by third countries.

An ALPS limited to one location could not defend the entire United States. If the launch came from a Soviet submarine patrolling off the U.S. coast, the sensors could not identify and track the warheads soon enough to provide trajectory data to the interceptors, and the interceptors could not reach the warheads in time.

ALPS might serve as the first step in the deployment of the more comprehensive defenses envisioned for SDI. However, if Congress continues to limit the size of the SDI budget and does not provide additional funding for a limited defense, ALPS might divert money from other systems that are a part of Phase I of SDI.

Three contractors have developed concepts for an ALPS. Lockheed has proposed a deployment of 100 long-range interceptor missiles; McDonnell Douglas has proposed a system that would combine 70 Lockheed missiles with 30 of its own shorter-range missiles. Both of these systems would rely on existing early warning satellites and radars to locate and track incoming warheads. Rockwell has proposed an ALPS concept that would use a platform that would carry small interceptor rockets and sensors high into the atmosphere where it would locate and destroy incoming warheads.

Before the United States decides whether to develop and deploy an ALPS, it must determine if such a system would be effective enough to justify its costs.

ISSUE DEFINITION

Ever since Senator Nunn proposed that the United States study the development of a defensive system that might protect against accidental and unauthorized launches of ballistic missiles, interest in the idea has grown. The debate has produced a broad consensus that the United States should consider the development of an Accidental Launch Protection System (ALPS). At the same time, Congress continues to explore the requirements for a defensive system that could protect against accidental and unauthorized launches of ballistic missiles, the relationship between an effective ALPS and the ABM Treaty, and the relationship between ALPS and other systems that might become a part of the Strategic Defense Initiative (SDI).

This issue brief will review the ALPS concept to address these and other issues that will remain a part of congressional debate over ALPS.

BACKGROUND AND ANALYSIS

Debate Over the ALPS Concept

During the last year, many have expressed an interest in the deployment of a limited defense against ballistic missiles. Some see a limited protection system as a logical first step in the deployment of the first phase of SDI. Others believe that a limited system should be the only step in the first phase of SDI; it could exploit existing technologies and provide some defense against accidental launches or missiles from third countries. At the same time, the United States could continue research into advanced technologies that might be part of more comprehensive defenses.

The current debate over limited defenses began in January 1988, when Senator Nunn proposed a limited defense against the accidental or unauthorized launch of a few ballistic missiles: "If carefully redirected, our research efforts could produce options for limited deployments to deal with the frightening possibility of an accidental or unauthorized missile launch." He claimed that this type of defensive system, which he called an Accidental Launch Protection System, or ALPS, represented a logical follow-on to the Nuclear Risk Reduction Centers that the United States and Soviet Union have established. He suggested that both countries combine the development of ALPS with a rigorous review of their safeguards designed to prevent the accidental or inadvertent launch of ballistic missiles. Senator Nunn further shaped the debate over ALPS by stating that the system "might be possible within the terms of the ABM Treaty or, at most, require a modest amendment." For the longer term, he urged research on advanced defensive technologies that might offer the best prospects for a comprehensive defense of the United States.

Senator Nunn's ALPS proposal attracted immediate and widespread attention among both supporters and opponents of the broader goals of SDI. For the most part, this reflects significant changes in the debate about SDI. Congressional skepticism about the feasibility and desirability of comprehensive strategic defenses -- systems that might protect large areas of the United States by destroying the

majority of the warheads in a large attack -- has increased during the last 2 years. With the money available for defense spending tighter than it was in 1986, Congress has continued to reduce the Administration's SDI budget requests.

Many supporters of SDI hope that the attention generated by the debate over limited defenses will help maintain support for the broader goals of SDI. The Pentagon and the Strategic Defense Initiative Organization (SDIO) have also shown some interest in ALPS, as long as it represents the first step towards Phase I of SDI. The Phase I Strategic Defense System would include a space-based interceptor and the ground-based Exoatmospheric Reentry Vehicle Interceptor Subsystem (ERIS); three surveillance and tracking systems based in space and on the ground; and a battle management/command, control and communications network. This type of defensive system might complicate an attacker's plans enough to deter an attack against the United States. (For a detailed description of the issues and technologies associated with Phase I deployment, see CRS Issue Brief 88033, The Strategic Defense Initiative: Issues for Phase I Deployment.)

Many opponents of the broader goals of SDI also support the concept of a limited defense against accidental and unauthorized launches of ballistic missiles. Public opinion polls indicate that most Americans believe the United States either already can defend against an accidental launch or should pursue opportunities to do so, and support for ALPS seems a prudent policy position. However, many critics of the broader goals of SDI have insisted that an ALPS comply with the terms of the ABM Treaty.

During the first half of 1988, both the Senate Armed Services Subcommittee on Strategic Forces and Nuclear Deterrence and the House Armed Services Committee's special panel on SDI held hearings to explore the ALPS concept. The contractors who would like to provide the components for the system -- Lockheed, McDonnell Douglas, and Rockwell -- described their concepts during these hearings. Analysts who evaluated possible Soviet responses to the development and deployment of an ALPS also presented their findings. Following these hearings, the House included an amendment in its version of the FY89 defense authorization bill that encourages SDIO to concentrate efforts for the first phase of SDI on technologies and systems that could protect the United States from accidental launch of ballistic missiles. The Senate version did not include similar provision. However, in its final form, the FY89 defense authorization bill includes an amendment encouraging the Secretary of Defense to direct SDIO to give priority to the development of such systems. At the same time, the House rejected an amendment directing SDIO to deploy specific defensive technologies at two specific locations to defend against accidental and unauthorized launches.

The concept of a limited defense against missiles was also reviewed and endorsed by several Reagan Administration panels. In a report sent to Secretary of Defense Carlucci in May 1988, the SDI Milestone Panel of the Defense Science Board endorsed the ALPS concept when it recommended that the United States pursue Phase I of SDI in six distinct steps. As a first step, the panel proposed "a limited deployment of long range ground based interceptors" that could provide "some preferential defense against small attacks, and some protection against accidental unauthorized launches." The panel noted that this type of system would "establish a base from which the BMD (Ballistic Missile Defense) system could evolve, put BMD

into the military operational structure and teach valuable lessons about the management and operations of such a system." Secretary Carlucci did not reject the recommendation, but he emphasized that its inclusion in the report did not indicate that the United States had changed its policy with regard to SDI. Nonetheless, he did continue to support the idea in his guidance to the Defense Acquisition Board during its annual review of SDI in early October 1988. SDIO had altered its concept for its Phase I deployments, but the new plan maintained the option to develop a limited protection system "given a future national decision and funding to do so."

President Reagan received a similar recommendation from the White House Science Council in October 1988. The Council's Strategic Defense Initiative Task Force suggested that the President include in his final budget a program for the near-term deployment of a limited protection system (LPS) that could be expanded into a more comprehensive strategic defense system. The Task Force stated that an LPS represents the "best option for the earliest possible deployment at minimum risk." It would protect against an accidental launch and would be a concrete step toward the deployment of a more ambitious system.

Although the threat of an accidental or unauthorized launch has received a lot of attention in the debate over ALPS, the actual risk of either event appears very low. Nevertheless, limited defenses could reduce the damage created by such an event, if it should occur. The critical question is whether an ALPS may be effective enough to justify its cost. The next section addresses some of the issues that might affect this decision.

Defense against Accidental and Unauthorized Launches

What is an accidental or unauthorized launch?

The specific capabilities required of the interceptors and radars included in an ALPS would depend on the threat the system might have to counter. Although the debate over the ALPS concept often describes a single threat, "accidental and unauthorized launches," these are different types of launches that can create very different threats. In general, an accidental launch might occur following a technical or mechanical failure in the missile's launch control system. This failure could occur either in the communications system that would control the launch of the missile or within the missile itself. An unauthorized launch would occur if a commander decided to launch the missiles under his control, without receiving instructions to do so from either his military or political superiors.

Most observers believe that an accidental launch would involve many fewer warheads than an unauthorized launch. They feel that an accidental launch would probably involve one missile. The ALPS would then have to counter, at most, 10 warheads. The number of warheads would be higher if the accident involved a few missiles, but the threat from either type of accident probably would contain far fewer than 100 warheads. On the other hand, because a Soviet commander who had access to the launch codes for one missile would probably have access to the launch codes for all the missiles under his command, an unauthorized launch might include up to

100 warheads from a flight of ICBMs or up to 200 warheads from a strategic submarine's entire complement of missiles.

ALPS might also protect the United States in case of a ballistic missile launch from a country other than the Soviet Union. At the present time, the only countries with ballistic missiles that could reach the United States are France, Great Britain, and China. However, many third world countries are attempting to develop or acquire ballistic missile technologies, and, in the future, one of these countries might be able to threaten the United States with a nuclear warhead carried on a ballistic missile. Nonetheless, an ALPS could only defend against a warhead carried on a ballistic missile; it could not stop an attack by a bomber or other type of vehicle.

Finally, a limited defense system might complicate Soviet efforts to launch a first strike against a small number of U.S. targets. The interceptors could be directed to defend those sites that the Soviet Union would be most interested in destroying.

What must an ALPS be able to do?

Although an ALPS would have to defend against a far smaller number of warheads than a more comprehensive defensive system, it would have to accomplish all the same kinds of tasks as a full SDI. The sensors in an ALPS would have to detect the launch of Soviet missiles and track the approach of incoming warheads. The sensors might also have to identify incoming warheads and distinguish them from Soviet penetration aids. The sensors would then have to guide the interceptors towards the incoming warheads so that, finally, the interceptors could destroy those warheads.

An effective ALPS must provide early warning of a launch and accurate tracking data for the interceptors. The sensors would have to detect and track missiles launched over the North Pole or from submarines patrolling off the coasts of the United States. The system could use existing early warning satellites to detect the accidental or unauthorized launch of Soviet missiles. An ALPS might rely on the existing Ballistic Missile Early Warning System (BMEWS) radars to track ICBMs and SLBMs travelling on trajectories over the North Pole. PAVE PAWS phased array radars -- in California, Texas, Georgia, and Massachusetts -- could track missiles launched from submarines patrolling off the coasts of the United States. Additional ground-based or space-based sensors, and ground-based battle management radars would have to provide interceptors with updated data on the path being followed by incoming warheads.

The United States would have to complete the improvements on its Ballistic Missile Early Warning System radars at Thule, Greenland, and Fylingdales in Great Britain and upgrade the BMEWS radar at Clear, AL, to enhance their ability to track missiles and provide the information needed by the interceptors. According to the Office of Technology Assessment (OTA), these upgraded radars would collect enough information to direct the launch of an ALPS interceptor towards a target if the interceptor could change its course in response to updated information provided later in its flight.

If the Soviet Union responds to U.S. research into strategic defenses by placing penetration aids on its ballistic missiles, ALPS sensors would have to identify the

warheads before the interceptors could destroy them. These penetration aids might include clouds of chaff that could conceal the location of the warheads or lightweight decoys that might have the same appearance to the sensors as actual warheads. Because several hundred lightweight decoys might replace a few warheads on Soviet missiles, an ALPS might face several hundred potential targets in the attack. (For a more detailed description of the decoys and penetration aids that the Soviet Union might use to confuse the interceptors in an ALPS, see The Implications of Accidental Launch Protection Systems for U.S. Security, Statement of Theodore A. Postol, Center for International Security and Arms Control, Stanford University, before the Panel on the Strategic Defense Initiative, House Armed Services Committee, Apr. 20, 1988.)

The interceptors in an ALPS would have to be launched almost immediately upon the detection of a missile launch for them to have enough time to reach incoming warheads before the warheads reached targets in the United States. If the missiles were launched from Soviet ICBM fields or strategic submarine ports, the warheads would reach the United States in around 30 minutes. This compares with only 10 or 15 minutes for warheads from submarines patrolling off the U.S. coasts. If the interceptors had the time and could achieve the velocity to reach incoming warheads before they reentered the atmosphere, the system might defend a large area of the United States. To locate and destroy warheads, the interceptors would have to receive updated information from the sensors on the track of incoming warheads; they would have to be able to change their direction in response to that information; and, if they destroyed warheads by colliding with them, the interceptors might need their own sensors so that they could home in on the incoming warheads.

What is the relationship between ALPS and the ABM Treaty?

The ABM Treaty, and its 1974 Protocol, limit the United States and the Soviet Union to 100 interceptor missiles deployed at one location. The Soviet Union deployed its system around Moscow. The United States selected Grand Forks, ND, as its one location in 1972, but it could change this site to Washington, DC. If an ALPS complied with these restrictions, it could not defend against all types of accidental or unauthorized launches of Soviet ballistic missiles.

If the United States deployed the interceptors and battle management radar for ALPS at Grand Forks, the system could not defend the coastal areas of the United States against an attack from a submarine patrolling off the coast of the United States. The warheads could reach targets in less than 15 minutes, so an interceptor would have to be launched as soon as early warning satellites detected the missile launch. In that case, an interceptor would leave Grand Forks before it had received any information on the likely track of the incoming missile. The interceptor could not receive additional information from the battle management radar at Grand Forks if the incoming warhead were aimed at a target along the coasts of the United States, because the curvature of the earth would hide the warheads from that radar.

The ABM Treaty's limit on the number of permitted interceptors would make ALPS unable to defend against an accidental or unauthorized launch of more than a few missiles. However, an ALPS could reduce the damage from an unauthorized attack. The limit of 100 interceptors might also complicate efforts to defend against an accidental launch of missiles carrying penetration aids. If the system's sensors

could not identify the warheads, they would have to direct interceptors towards each possible target and the decoys would overwhelm the system.

The ABM Treaty also bans the deployment of ABM systems for the defense of the territory of each country and the deployment of systems that could provide the basis for such a defense. The deployment of an effective ALPS might conflict with this central objective of the Treaty, even if it only included 100 interceptors based at one location. With the wide area of coverage the contractors claim their systems can provide, the ALPS might be seen as providing a base for a defense of the country. This might be hard to deny if the supporters of the broader goals of SDI based their support for ALPS on its ability to serve as the first step for a Phase I deployment.

If the United States wanted to increase the number of interceptors or expand the number of locations where it deployed interceptors to enhance the system's effectiveness, especially against unauthorized launches, it would have to amend or abrogate the ABM Treaty. However, these changes would also permit the Soviet Union to expand its ballistic missile defenses. Some observers believe that, under an ABM Treaty that permitted the countries to deploy a greater number of BMD facilities and interceptors, it might be easier for both countries to prepare to break out of the remaining constraints in the ABM Treaty. As a result, changes in the ABM Treaty that might permit a more effective ALPS might also trigger a destabilizing arms race in offensive forces that could overcome the other country's enhanced defensive capabilities.

What is the relationship between ALPS and the broader goals of SDI?

During the debate over ALPS, both supporters and opponents of the broader goals of SDI have wondered whether ALPS would represent the first step or the last step in the deployment of ballistic missile defenses. ALPS might provide a "foot in the door" for SDI because the contractors who have developed concepts for ALPS all used technologies that might be included in a more comprehensive defensive system. The SDI Milestone Panel of the Defense Science Board also explicitly recommended that an ALPS type of system serve as the first of six steps in the deployment of Phase I of SDI. Because an ALPS might provide information about the construction and operation of strategic defenses it could well contribute to the development of more capable systems for Phase I of SDI.

On the other hand, the debate over ALPS might divert attention and money from the technologies needed for Phase I of SDI. It could satisfy the American people's hopes for some defense while avoiding the costly effort to develop and deploy more comprehensive defenses. In addition, ALPS might eventually replace Phase I of SDI. In his speech to the Arms Control Association, Senator Nunn did suggest a redirection of SDI towards ALPS in the short term and more promising advanced technologies in the long term. The House approved an amendment to the FY89 Defense Authorization bill that prohibits the expenditure of more than 40% of SDIO's budget on the development of Phase I. If the SDI budget remained at around $5 billion a year, and the Defense Department tried to deploy an ALPS during the early 1990s, an ALPS costing between $5 billion and $10 billion could absorb approximately 40% of SDIO's budget. In that case, ALPS would divert money from Phase I of SDI,

unless the budget for ALPS came from another agency or service, such as the Air Force.

Some observers are concerned that the Soviet Union might view an ALPS as part of a larger effort to develop and deploy more comprehensive defenses, regardless of whether the United States actually uses it as the first step or the last step in its deployment of strategic defenses. For example, if the United States designed ALPS with enough interceptors to defend against an unauthorized launch of several missiles, the system might also be able to defend against a limited, authorized strike by the Soviet Union. In fact, the contractors who are developing interceptors that might be used in an ALPS have begun to focus on the role that limited defenses might play in disrupting a Soviet attack. The Soviet Union might respond by accelerating the deployment of penetration aids on its ballistic missiles so that it could overcome U.S. defenses. However, if the Soviet Union did react to the deployment of an ALPS with the deployment of penetration aids, an ALPS might not be able to defend against even an accidental launch of a few Soviet missiles. Consequently, if the Soviet Union reacts as if ALPS were the first step in a more comprehensive defense, ALPS may be unable to perform the mission that initially prompted its development.

Proposed ALPS Concepts

Lockheed, McDonnell Douglas, and Rockwell have developed concepts for a system that would defend against the accidental or unauthorized launch of ballistic missiles. These concepts are still in the study stages, and are based on technologies that the contractors have developed for the broader SDI program.

Lockheed and McDonnell Douglas' Concepts

Lockheed and McDonnell Douglas have developed ALPS concepts that would use facilities available at Grand Forks, ND, the site where the United States built, then dismantled, its permitted anti-ballistic missile (ABM) system during the 1970s. Both contractors have suggested that the existing ABM battle management radar, the Perimeter Acquisition Radar Attack Characterization System (PARCS), at Grand Forks be replaced with a new phased array battle management radar. This new radar would enable an ALPS to gather better data on the paths of the incoming warheads, and would provide updated information to direct the interceptors to their targets. Both contractors have also suggested that ALPS include the Ground Based Surveillance and Tracking System, a long wavelength infrared sensor that would be launched into space on warning of an attack. This sensor, which is being developed as part of the Phase I SDI deployment, would provide more precise tracking data for the interceptors and help discriminate between actual warheads and decoys.

The contractors have offered different proposals for interceptors to go with the upgraded radar and tracking capabilities. Lockheed's proposal uses 100 ERIS (Exoatmospheric Reentry Vehicle Interceptor System) interceptors based at Grand Forks. ERIS missiles would try to destroy an incoming warhead by colliding with it before it reentered the atmosphere. Each interceptor would include an infrared

homing device to help locate the target, a rocket motor that could change the speed and direction of the interceptor so that it could home in on the target, and a "screen" around the front of the interceptor to increase the area over which the interceptor could destroy a warhead.

Because ERIS interceptors are designed to destroy warheads outside the atmosphere, before they get close to specific targets, Lockheed suggests that an ALPS using ERIS might defend a wider area of the United States than it could if it destroyed warheads later along their flight paths. With the range created by velocities approaching 17,000 miles per hour, ERIS missiles might be able to intercept warheads aimed at targets around the country.

Some critics believe that an ALPS using ERIS interceptors could not defend as wide an area of the United States as Lockheed has indicated. For example, the interceptors might not be able to defend the coasts of the United States if the attack were launched from patrolling submarines. Lockheed's current rocket engine for ERIS could reach velocities of 11,000 miles per hour, but that would not be fast enough for the interceptors to reach submarine-launched warheads targeted at coastal areas before those warheads reentered the atmosphere. Lockheed is attempting to develop an improved rocket for ERIS that could reach velocities of 17,000 miles per hour, which, in theory, would give ERIS the capability to defend the coasts. However, the interceptor still might not receive the guidance data it would need to track and intercept warheads. The Grand Forks battle management radars could not track missiles launched from submarines off the coasts of the United States because they would be hidden by the curvature of the earth, and ALPS would have to launch the ERIS rockets before the PAVE PAWS radars could begin to track the missiles.

In addition, critics argue that the sensors on ERIS rockets might not be able to distinguish between warheads and lightweight decoys or locate the warheads in clouds of chaff. If the ALPS had to target one interceptor at each potential warhead, a system that included 100 interceptors could not reliably defend against the accidental launch of even one MIRVed missile with decoys.

McDonnell Douglas' ALPS concept would combine 70 ERIS interceptors with 30 of its own HEDI (High Endoatmospheric Defense Interceptor) missiles at Grand Forks. HEDI missiles might also achieve velocities greater than 10,000 miles per hour and use an infrared sensor to home in on their targets. While ERIS would attempt to destroy warheads before they had entered the atmosphere, HEDI would destroy them later on their flight paths, after they had entered the atmosphere.

McDonnell Douglas argues that this system, with two layers of defense, will provide better protection than a single-layered system with ERIS. Layered coverage can improve the probability of destroying an incoming warhead since it gives the system a second shot at a warhead missed by the exoatmospheric interceptor. McDonnell Douglas indicates that a two-layered defense of ERIS and HEDI interceptors combined with the proposed new battle management radar and the Ground-Based Surveillance and Tracking System sensor would have a leakage rate of around 6%. However, because the system would launch a second interceptor at the warheads that were not destroyed by ERIS interceptors, it might only be able to defend against an accidental launch. It might be overwhelmed by the number of warheads in an unauthorized launch.

McDonnell Douglas acknowledges that its concept could not defend against SLBMs launched from submarines patrolling off the coasts of the United States if it only included interceptors based at Grand Forks. Consequently, McDonnell Douglas has developed a concept for an expanded coastal deployment for ALPS. This system would combine the interceptors located at Grand Forks with interceptors located at five additional sites along the coasts of the United States. Each additional site would include one ground-based battle management radar and around 140 HEDI interceptors. The expanded system might also include three Ground-Based Surveillance and Tracking sensors on each coast. McDonnell Douglas believes that the 140 interceptors at each additional site would be enough to defend against a launch of missiles from a Soviet Delta-class submarine (up to around 100 warheads), if the missiles did not carry penetration aids. McDonnell Douglas recognizes that, because the ABM Treaty limits each side to a defensive system deployed at one location, the United States would have to amend or abrogate the Treaty to pursue this option.

Rockwell's Concept

Rockwell has proposed a system of 100 AERIE (Aerial Intercept Element) platforms, based around a particular site. The system would launch one AERIE platform towards each incoming warhead. Each platform, which looks like a small airplane, contains sensors and a number of small interceptor rockets. Each platform would travel to an altitude of approximately 25 km to 30 km, where it would glide, waiting for an approaching warhead to reenter the atmosphere. The sensors on the platform would then seek to direct the interceptors towards the warhead.

Rockwell believes this system would provide better coverage than a system based on ERIS because it would use the atmosphere to discriminate between warheads and decoys. The early warning sensors and battle management radars in an ALPS might not be able to identify lightweight decoys before they enter the atmosphere, but the atmosphere slows decoys much more than the heavier warheads, which could eliminate the need for the sensors to discriminate between decoys and warheads. Rockwell also believes that this system could provide a better endoatmospheric defense than a system that used HEDI. An AERIE platform would not have to travel at velocities as great as those needed for HEDI because it could be launched before the system knew the precise track of incoming warheads. HEDI missiles would have to wait for that information. With AERIE, the system could launch individual platforms in the general direction of the incoming warheads immediately upon warning, then each platform could launch its interceptor towards a more precise location after its on-board sensor had located and identified a target.

Rockwell initially designed each AERIE platform to carry six interceptor rockets, and it claims that the use of six interceptors against each incoming warhead would provide the system with a very low leakage rate. However, a system that complied with the terms of the ABM Treaty could carry only one interceptor on each platform since the Treaty prohibits the deployment of ABM systems that carry more than one interceptor warhead on each interceptor launcher. Consequently, an ALPS that relied on the AERIE system might have to direct six platforms towards each incoming warhead. This would reduce the number of warheads that the system could destroy,

if the system only included 100 interceptors, and it would sharply reduce its effectiveness against unauthorized launches.

Rockwell acknowledges that its ALPS concept could not defend the entire United States against an accidental or an unauthorized launch of ballistic missiles. Because the system has no exoatmospheric intercept capability, it would essentially defend an area around the particular location where it was deployed. Although Rockwell has not proposed a location for its system, it suggests that a system deployed around Washington, DC, would not only protect Washington from a strike designed to disrupt the national command authority, it would also defend much of the eastern United States.

Cost Estimates

All three contractors have provided estimates for the costs for their systems. Lockheed estimates that its system would cost around $4.9 billion. The ERIS missiles would cost approximately $3.5 billion; the remaining amount would cover the 10-year life cycle costs of the new ground-based radar at Grand Forks and three Ground-based Surveillance and Tracking System sensors. McDonnell Douglas puts the cost of its system between $8 billion and $10 billion if it were limited to 100 interceptor missiles and the radars based at Grand Forks. Each of the additional sites in its expanded ALPS might cost up to $3 billion. Finally, Rockwell indicates that its AERIE system might cost around $3.3 billion if it included 100 platforms and interceptors. This figure does not include the costs of any additional radar improvements.

CHRONOLOGY

09/28/88 --- Congress passed new FY89 Defense Authorization Bill that encourages Secretary of Defense to direct SDIO to give priority to the development of systems for an ALPS.

08/03/88 --- President Reagan vetoed FY89 Defense Authorization Bill that included language directing SDIO to concentrate development efforts for Phase I of SDI on systems for an ALPS.

05/13/88 --- During debate on FY89 Defense Authorization bill, the Senate tabled an amendment authorizing $100 million for the deployment of an ALPS.

05/11/88 --- During debate on FY89 Defense Authorization bill, the House passed an amendment stating that SDIO should concentrate development efforts for the first phase of SDI on technologies and systems capable of protecting the United States from the accidental launch of an ICBM..." The House defeated an amendment stating that an ALPS system should include both ERIS and HEDI missiles and should be deployed at Grand Forks, ND, and Washington, DC.

04/20/88 --- Hearings held by the House Armed Services Committee, Special Panel on SDI.

03/22/88 --- Hearings held by the Senate Armed Services Subcommittee on Strategic Forces and Nuclear Deterrence.

01/19/88 --- Senator Nunn proposed a redirection of SDI towards the study of "limited deployments to deal with the frightening possibility of an accidental or unauthorized missile launch."